Understanding the associations between eye movement patterns, task performance, and cognitive abilities through Eye Movement analysis with Hidden Markov Models (EMHMM)

Dr. Janet H. Hsiao, Ph.D., Associate Professor
Department of Psychology, the University of Hong Kong

Time : 1230 – 1400, TUE, June 5, 2018
Venue : MW531, the University of Hong Kong

Eye movements in cognitive tasks are shown to reflect underlying cognitive processes. Recent research has reported substantial individual differences in eye movement patterns in cognitive tasks, which can potentially be used for understanding individual differences in task performance and cognitive abilities. In this talk, I will introduce our state-of-the-art Eye Movement analysis with Hidden Markov Models (EMHMM) approach that aims to account for individual differences. In this approach, each individual’s eye movements are modeled with an HMM, including both person-specific regions of interests (ROIs) and transitions among the ROIs. Individual HMMs can be clustered to discover common patterns, and similarities between patterns can be quantitatively assessed. Through this clustering, we discovered holistic (looking mostly at the face center) and analytic (looking mostly at the two eyes in addition to the face center) patterns in face recognition. Interestingly, analytic patterns were associated with better face recognition performance and higher activation in brain regions important for top-down control of visual attention, whereas holistic patterns were associated with ageing and lower cognitive abilities in older adults. These results demonstrated the advantage of EMHMM for informing strategies that enhance task performance and suggested the possibility of using eye movements as an easily deployable screening assessment for cognitive deficits.